cerely hope that, for the benefit of posterity, his records of cases will not share the same fate as befel Hunter's. Sir James is, however, rather sceptical as to the value of the observations which he has recorded at the cost of so much labour, for he says: "While looking through, and in some degree studying, the many thousand cases thus recorded, it has not been difficult to find why they would be now so nearly useless and uninteresting to anyone but myself." The changes which a progressive science like surgery necessarily undergoes in the course of sixty-one years enable the notes to be read by the light of our present knowledge, often with disheartening results when we reflect how difficult a thing it is to interpret a fact, even when it has been recorded. The use, however, of keeping up such a series of case-books is thus forcibly put forward by the author:—"The habit of recording facts is nearly essential to the habit of accurately observing and remembering them. That which we intend to record we are bound, and may be induced, to observe carefully, and the very act of carefully recording is nearly equivalent to a renewed observation." These studies, however, are not mere transcriptions from the old case-books, but they are a series of short essays upon rare or little-considered surgical cases which from time to time have come under the notice of the author. Each essay is full of that philosophy which can only be acquired by the most highly cultivated minds, and even by them only after a long and observant career. Each essay, too, is full of suggestion for further work—work which will not be carried out by Sir James Paget himself, but work which he may well live to see carried through by the younger generation of scientific surgeons, who look to him as a friend and a guide in those numerous difficulties which beset all earnest inquirers after truth.

The essays are seventeen in number, and, with a few exceptions, deal with subjects which are of interest only to the medical man. Two of the chapters are of interest to the general reader, however—that on errors in the chronometry of life is the most interesting, in which an attempt is made to show how many of the phenomena in health and disease may be explained by assuming that they are due to a disturbance of the time-rate at which the processes of life are discharged. For example, certain turtles lay their eggs in hollows made in the sand, leave them there to be hatched, and, at the time of hatching, return to them for the sake of their young. It might be asked, How can these creatures, and many others in similar cases, reckon the passage of time? Most probably they do not reckon it at all: but just as the timely-attained fitness of their organization for preparing and filling their nests impelled them to those acts, so some time-regulated organic processes, taking place in them after the laying of their eggs, bring about at length a new condition, of which a dim consciousness becomes an impulse to them to return to their nests. In the other essay of general interest, Sir James Paget discusses the use of the will for health.

OUR BOOK SHELF.

Euclid's Elements of Geometry. Books III. and IV. Edited by H. M. Taylor, M.A. (Cambridge: University Press, 1891.)

IT is only of late years that the University of Cambridge has taken the wise step of giving greater scope to the teaching of geometry by not insisting on the actual proofs of propositions as presented in Euclid's text. All the definitions, axioms, and postulates, together with the sequence of propositions which he adopted, are retained, but in solving them "no proof will be accepted that assumes anything not proved in preceding propositions."

The work under consideration is published in the "Pitt Press Mathematical Series," and it will be found to contain some important changes, both with regard to the proofs and method of arrangement. In the first few propositions of Book III. the author has introduced several proofs which seem preferable to those generally adopted, while their order of sequence has been extensively changed. The alterations in the remaining propositions of this book have not been carried to any extent, but several outlines of alternative constructions have been inserted in cases where they may be most instructive.

Of the additional propositions introduced, one involves the principle of the rotation of a plane figure about a point in its plane, while following Proposition 37 are two others, the latter of which is commonly known as Ptolemy's theorem. Ten other additional propositions are at the end of this book, and they will serve as a good introduction to the many theorems on poles and polars, radical axes of circles, orthogonal circles, and the nine-point circle of a triangle. In the fourth book the propositions are as usual, no material alteration having been made. Throughout the work each proposition is accompanied by numerous exercises, while a capital set of miscellaneous problems terminates each book. We may safely say that the work of which this is an instalment will take the first place among the many books on the elements of geometry.

Zoological Articles contributed to the "Encyclopædia Britannica." By E. Ray Lankester, M.A., &c., and others. (London: Adam and Charles Black, 1891.)

UNDER the above title, Prof. E. Ray Lankester has republished a series of articles communicated by himself and others to the recently published edition of the "Encyclopædia Britannica," the whole forming a very admirable and well-illustrated treatise on some of the more important groups of the animal kingdom.

The memoirs on the Protozoa, Hydrozoa, Mollusca, Polyzoa, and Vertebrata are by Prof. Lankester; that on the Sponges is by Prof. Sollas; that on the Planarians is by Prof. von Graff; that on the Nemertines is by Prof. Hubrecht; that on the Rotifers is by Prof. Bourne; and that on the Tunicates is by Prof. Herdman.

While not professing to be a complete hand-book to zoology, this volume will be a very useful one to the student, as it will give him an excellent summary of the most recent views of the above specialists on the various groups treated of.

A few new figures have been added to the original text, and a few errors—due to previous oversight—have been corrected. Some quite recent discoveries are alluded to in footnotes, while in the preface Prof. Lankester points out one or two important alterations in classification and nomenclature which it was not possible to incorporate in the text.

The illustrations are refreshingly new, and they are as attractive as instructive. This volume is one we can very strongly recommend to all working students.

The British Empire: the Colonies and Dependencies. By W. G. Baker. (London: Blackie and Son.)

THIS volume is one of the series known as "Blackie's Geographical Manuals," and forms the second part of a book on the British Empire, the first part having dealt with "the home countries." The author sets to work systematically, beginning with the British possessions in Europe, then advancing to those in Asia, Africa, America, and Australasia. The method he adopts in describing

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the various countries included in the British Empire has the great merit of being natural, simple, and clear. The position and extent of each country are first noted; next he explains the form of surface, describes the climate, and traces the coast-line. Details as to population, industries, and commerce come afterwards, and these are followed by "such facts concerning the social and political condition of the people as are usually included in a course of geography for children: the form of government, and descriptions of the political divisions and chief towns." Mr. Baker has selected his facts with much discretion, and presents them in a way which is likely to interest young readers and to exercise the intelligence as well as the memory. There are many very good illustrations and several coloured maps.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

The Rôle of Quaternions in the Algebra of Vectors.

Prof. Gibbs seems to forget that his pamphlet was specially announced as *Arranged for the use of Students in Physics.* When I wrote the remark which has called forth his recent letter, I was discussing the reasons for the comparatively slow progress of Quaternion Analysis in recent times. And, as it is precisely to students of Physics that I think we must look for such progress, anything which is calculated to divert their attention from Quaternions, or to confuse them in their use of Quaternion symbols, must be regarded as tending to retard the progress of the method. The Vector-Analysis supported by Prof. Gibbs involves a serious departure from the usage of ordinary Algebra, inasmuch as $\alpha\beta$ is not regarded as a product, but merely as a "kind of product." This is specially likely to confuse an ordinary student, and is undoubtedly artificial in the highest degree:—while one of the chief recommendations of Quaternions is their naturalness, *i.e.* the utter absence of artifice in their fundamental rules.

Some of Prof. Gibbs' suggested notations are very ingenious, and well calculated to furnish short cuts to various classes of results *already obtained.* But they do not seem to have led to any important extensions of such results; and must therefore be regarded as having claims to consideration very much inferior to those of the novelties of notation suggested by Mr. M'Aulay; for these have undoubtedly shown their value as instruments of research, while they do not depart from algebraic usage in a matter so fundamental as is the notation for ordinary multiplication.

It is singular that one of Prof. Gibbs' objections to Quaternions should be precisely what I have always considered (after perfect inartificiality) their chief merit:—viz. that they are "*uniquely adapted to Euclidian space,* and therefore specially useful in some of the most important branches of physical science." What have students of physics, as such, to do with space of more than three dimensions?

I do not agree with Prof. Gibbs in his statements as to the superiority of his notation over that of Quaternions, so far at least as can be judged from the examples he cites. Surely the simple equality

$$\mathrm{S}\sigma\phi\rho = \mathrm{S}\rho\phi'\sigma = \Sigma(\mathrm{S}\alpha\sigma\mathrm{S}\lambda\rho)$$

shows, at least as plainly as does

$$\sigma.(\alpha\lambda + \beta\mu + \gamma\nu).\rho = \rho.(\lambda\alpha + \mu\beta + \nu\gamma).\sigma,$$

that the common value is "exactly the same kind of function of σ that it is of ρ." As to $\mathrm{S}\sigma\phi$, it is simply meaningless, and I cannot imagine anyone writing such an expression.

But I have a positive objection of another kind to Prof. Gibbs' proposed notation. To save complexity a great number of *indispensable* brackets, or their equivalents, are omitted. If all the really necessary signs of this kind were inserted, the translations of moderately complex quaternion formulæ into his language would be frightful even to look at. To take a very simple case:—so far as I understand him Prof. Gibbs would write

$$(\alpha \times \beta) \times (\gamma \times \delta) \times (\epsilon \times \zeta)$$

as the equivalent of

$$\mathrm{VV}(\mathrm{V}\alpha\beta\mathrm{V}\gamma\delta)\mathrm{V}\epsilon\zeta.$$

But, if so, how would he write, without additional parentheses,

$$\mathrm{VV}\alpha\beta\mathrm{VV}\gamma\delta\mathrm{V}\epsilon\zeta, \quad \mathrm{V}.\alpha\beta\mathrm{VV}\gamma\delta\mathrm{V}\epsilon\zeta, \quad \mathrm{V}.\mathrm{V}\alpha\beta\mathrm{V}\gamma\delta\mathrm{V}\epsilon\zeta, \text{ \&c.?}$$

Even the first of the four just written has but *one* pair of brackets, besides the five Vs; while Prof. Gibbs' equivalent has *three* pairs of brackets, besides the five ×s. And, so far as I can see, Prof. Gibbs must invent a new notation entirely for the last two formulæ written above, since the product of three vectors is nowhere provided for in his system, important as it is and of constant recurrence in physical problems.

St. Andrews, April 25. P. G. Tait.

P.S.—As I see that the correspondence in the *Athenæum* regarding the notice of Hamilton in the *Dictionary of National Biography*, has just been summarily closed, I would remark that the patent error of that notice is the confusion of Hamilton's *Varying Action* with his *Quaternions.* The consequence is that Hamilton gets no credit whatever for his absolutely invaluable contribution to Theoretical Dynamics!

The Influenza.

The influenza—or the peculiar fever we know by that name—seems to be again making its appearance amongst us; at present in scattered cases in the towns, villages, and country districts of the west of England, and with some severity in Yorkshire. How is it that having had the disease once does not give immunity against future attacks, as is more or less generally the case with diseases of this kind, *i.e.* those caused by microbes, as this is now held to be? It would be interesting if some statistics could be arrived at with regard to the present outbreak, showing the proportion of cases of those who had already had influenza, and of those, who, having escaped before, have now taken the disease. E. Armitage.

April 22.

Antipathy [?] of Birds for Colour.

Your correspondent "M. H. M." asks the question in your issue of April 16 (p. 558), "Has the sparrow an aversion to yellow?" because of its habit of destroying, as if in wantonness, the petals of crocuses of that particular colour. From some observations I made on the subject, when it was broached about four years ago, an account of which appeared in your columns (vol. xxxvi. p. 174), it is evident that the birds show a decided *fondness* for the colour, instead of an aversion to it. In the case I described, the birds used laburnum sprays only for their nests. It may interest your correspondent to know of such an incident, and to refer to the other correspondence on the subject alluded to on the occasion. William White.

The Ruskin Museum, Sheffield, April 22.

A Meteor.

Seeing the note in your issue of the 16th inst. (p. 566) as to a meteor observed by a lady correspondent at Ruanlanihorn, Cornwall, on March 26 last, I send you the following extract from my note-book in reference to a meteor observed by me at Martock, Somerset, on the same evening, and which there would seem to be little doubt was the same as that referred to in your note:—

"March 26.—At Martock, Somerset, saw a very fine meteor in the southern sky; time 7.16 p.m. It was travelling from west to east at a comparatively slow speed; the meteor was of a white hue, and left a visible train, in length about equal to the apparent diameter of the moon; the train was a deeper yellow tint and was broken up towards its end. The meteor was visible fully 5 seconds."

Martock is about 110 miles from Ruanlanihorn.

Addiscombe Road, Croydon, April 20. W. Budgen.

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